# Ocular Emergencies

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# What Classifies an Emergency?

- Ocular complaints
- Vision complaintsSystemic complaints

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# Optometrists & Emergencies

- •How many people visit urgent care/ER for ocular problems?
- •Optometrists are best suited to handle eye emergencies
  - Urban/suburban setting
  - Rural setting
  - Going to urgent care vs optometrist
  - Integrated health care model

Office Protocols of emergencies

- •Triage training
  - Same day/asap appointments
  - Within 24 hours
  - At earliest convenience
  - At a future date
- Document, Document, Document
- •Importance

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# Taking call as an optometrist

- •Required by state? Required by insurance panels?
- Value to the patient

Let's get to some cases!

# Case #1

- 43 year old male, mechanic
- HPI: "battery acid exploded into right eye", immediately felt pain
- -no improvement after irrigation with tap water
- (+) pain 9/10 severity
- (+) photophobia
- (+) blurry vision
- (+) watering

# History

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- Medical history: hypothyroidism
- Medications: levothyroxine
- Allergies: Penicillin (hives)
- Ocular history: unremarkable LEE 4mo ago, glasses full time, daily disposal CLs prn
- Social history: 5 drinks/week, "social smoker"

# Entrance Testing

- BCVA: 20/400 OD NIPH; 20/20 OS
- Pupils: PERRLA, (-)APD
- Confrontational VF: grossly full, inconsistent responses in OD
- $\underline{\text{FOMs}}\text{:}$  Full & Smooth OU, (-)nystagmus
- IOP: (iCare) 12 mmHG OD, 12 mmHG OS

	OD	os
Lids & Lashes	Erythematous upper & lower lid	Normal
Conjun ctiva/S clera	2+ injection; 1+ chemosis	White & Clear
Cornea	See photo	Clear
A/C	Deep & Quiet	Deep & Quiet
Iris	Green, Grossly normal	Green, WNL
Lens	Clear	Clear

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# Posterior Pole Findings

	OD	os
Vitreous	Clear	Clear
Optic nerve	Pink, healthy rim 0.2/0.2 C/D ratio	Pink, healthy rim 0.3/0.3 C/D ratio
Macula	Flat & clear	Flat & clear
Retina	No breaks/tears	No breaks/tears

What do you do next?

# pH of Tears

- At arrival: 6
- After irrigation of normal saline (15min)
- What is the normal range for tears?



# Diagnosis

Differential Diagnosis:
-Corneal abrasion (mechanical trauma, foreign body, etc)
-Corneal Infections (viral, bacterial, fungal)

# What is your Diagnosis?

Diagnosis:

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Corneal chemical Burn OD

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# Types of Chemical Burns

- Neutral (Pepper Spray)
- Acidic
  - Bind with tissue proteins causing coagulation  $\Rightarrow$  stops further penetration
  - Usually less harmful
  - Exception: hydrofluoric acid
- - Lipophilic → penetrate ocular tissues more quickly & deeper
  - Penetrates corneal stroma via saponification of fatty acids in cellular
  - Damaged Stromal Tissue → proteolytic enzymes released → liquefactive necrosis

pool cleaner)  Nail polish  Lime (plaster, mortar, cement, white wash)	Acidic Agents (pH <4)	Alkali Agents (pH >10)
hydrochloric Acid (swimming pool cleaner)  Nail polish  MgOH (Firework sparklers, flares)  Lime (plaster, mortar, cement, white wash)	Sulfuric Acid (Car batteries)	, , ,
pool cleaner)  Nail polish  Lime (plaster, mortar, cement, white wash)	Acetic Acid (Vinegar)	, ,
white wash)	, ,	MgOH (Firework sparklers, flares)
	Nail polish	
Mixed cement		Mixed cement
Ammonia		Ammonia

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Acidic Agents (pH <4)	Alkali Agents (pH >10)
Sulfuric Acid (Car batteries)	Ammonia (cleaning agents, fertilizers, refrigerants)
Acetic Acid (Vinegar)	Lye (drain & oven cleaners, Drano, air bags)
Hydrochloric Acid (swimming pool cleaner)	MgOH (Firework sparklers, flares)
Nail polish	Lime (plaster, mortar, cement, white wash)
	Mixed cement
	Ammonia



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# Irrigation

-damage can happen within 5 minutes

-begin immediately after splash occurs

-irrigate over CLs

-eye wash station, shower, outdoor hose

-pH levels often normalize within 30min of continuous irrigation (at least 32oz)

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# Treatment & Management

- Stabilize ocular surface pH
- Slit Lamp Examination
  - Lids, cornea, limbus, conjunctiva, adnexa
- IOP

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#### **Treatment Goals**

- prevent infection → broad-spectrum antibiotic
- promote re-epithelialization → debridement
- control inflammation → steroid
- minimize sequelae → cycloplegic, anti-glaucoma therapy

# Roper-Hall Classification

Grade	Prognosis	Cornea	Conjunctiva/Limbus
- 1	Good	Corneal epithelial damage	No limbal ischemia
II	Good	Corneal haze, iris details visible	<1/3 limbal ischemia
Ш	Guarded	Total epithelial loss, stromal haze, iris details obscured	1/3 to ½ limbal ischemia
IV	Poor	Cornea opaque, iris and pupil obscured	>1/2 limbal ischemia

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#### Grade I Treatment

- Steroid (1% prednisolone acetate qid)
- Topical antibiotic ung (erythromycin qhs to qid)
- Preservative-free artificial tears
- Cycloplegic for pain



#### Grade II & III Treatment

- Topical antibiotic (fluoroquinolone) qid
- Topical steroid q1hr while awake (may need to taper)
- Long-acting cycloplegic (1% atropine)
- Oral pain medication prn
- Oral doxycycline to reduce corneal melting through MMP inhibition Oral vitamin C (1,000-2,000 mg) qid
   Good Correal haze, iris details visible
- Sodium ascorbate drops (10%) while
- Preservative-free artificial tears prn ■ Debridement of necrotic tissue
- Amniotic membrane

# **Grade IV Treatment** Stem cell transplantation Penetrating keratoplasty Keratoprosthesis ■ Tenoplasty to re-establish limbal vascularity

# Long Term Complications

- poor vision
- corneal scarring
- xerophthalmia ■ symblepharon
- dry eyes
- uveitis
- cataract
- adnexal abnormalities (lagophthalmos, entropion, ectropion and trichiasis)
- glaucoma

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# Case 1: 43 yo male

#### Treatment

- 0.3% ciprofloxacin qid
- Erythromycin ung qhs
- 1% pred acetate q2hr • 1% cycloplegic tid

#### • Follow-up

- RTC 1 day
- Complete resolution 6 days
- BCVA after resolution: 20/20

# Staff Triaging

- -Preliminary irrigation take place on site immediately
- -irrigate eye for 20-30min before coming to office
- · -irrigate over contact lenses
- · -bring container of chemical or MSDS card
- · -Time is critical
- · -Document, document, document

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#### Corneal Burn Clinical Pearls

- Stabilize pH (acidic vs alkaline)
- Thorough case history & examination
- Watch IOP
- Prevent infection
- Minimize sequelae

#### Case #2

- 56 year old male
- HPI: "right eye hurts", began 1-2 week ago
- -thinks he scratched eye after removing contact lenses
- (+) pain 2/10 severity
- (+) photophobia
- (+) blurry vision
- (+) watering

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# History

- <u>Medical history</u>: Anxiety, Depression, HTN, neuropathy (feet)
- Medications: lisinopril, Effexor, Xanax
- Allergies: NKDA
- Ocular history: unremarkable LEE 5 years ago, Monthly MF contact lenses
- · Social history: 1-2 drinks/week, non-smoker

# **Entrance Testing**

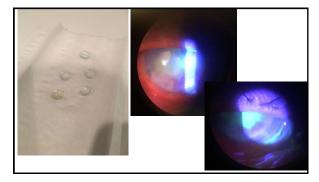
- BCVA: HM @ 4ft OD NIPH; 20/30 OS
- Pupils: PERRLA, (-)APD

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- Confrontational VF: grossly full OU
- EOMs: Full & Smooth OU, (-)nystagmus
- IOP: (iCare) 17 mmHG OD, 16 mmHG OS

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	OD	os
E Lids & Lashes	Normal	Normal
Conjunctiva/Sclera	3+ injection	Trace Injection
Cornea	Contact Lens Diffuse edema Central epi defect Neovascularization (0.5mml & N)	Contact Lens
A/C	Hazy View	Deep & Quiet
Iris	Brown, Grossly normal	Brown, WNL
Lens	Trace NS	Trace NS



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Posterior Pole Findings		
	OD (Hazy View)	os
Vitreous	Quiet-no cells	Quiet-no cells
Optic nerve	Pink, healthy rim 0.3/0.3 C/D ratio	Pink, healthy rim 0.3/0.3 C/D ratio
Macula	Flat & clear	Flat & clear
Retina	No breaks/tears	No breaks/tears

# Diagnosis

- Differential Diagnosis
   corneal abrasion
   corneal infiltrate
- What's your diagnosis?

#### **Diagnosis**

Corneal ulcer secondary to contact lens over wear

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#### Sterile vs Infectious Infiltrate

Sterile	Infectious
Smaller lesion (<1mm)	Larger lesion (>1mm)
Peripheral location	Central location
Minimal epithelial damage	Significant epithelial defect
No mucous discharge	Mucopurulent discharge
Less pain or photophobia	Pain & photophobia
No or minimal A/C reaction	Anterior chamber reaction
No lid involvement	Lid edema, hypoyon

#### Infectious Infiltrates

- Viral=adenovirus, EKC, HSV, HZO
- Bacterial=Staphylococcus, Strephtococcus, Pseudomonas
- -Contact lenses: Pseudomonas aeruginosa - Staphylococcus aureus
- Fungal

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■ Protozoan=Acanthamoeba

Contact Lens patient=treat as infectious until proven otherwise

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# Non-infectious infiltrates

- Marginal corneal infiltrates
- Contact lens-induced acute red eye (CLARE)
- Contact lens-induced peripheral ulcer (CLPU)
- Infiltrative keratitis

# Culturing

- When to Culture:
- -Large, central ulcer -unresponsive to treatment
- -post-surgical, monocular, or immunocompromised -3-2-1 Guideline: 3mm size, 2+ ulcers, 1mm visual axis
- -Best to perform culture before initiating treatment
- -"Quick culture": sterile swab placed in prepared (thioglycolate) broth and sent to lab to be placed on nutrient plates

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#### Treatment

- Antibiotic
  - $\circ$  Fluoroquinolones: Gram & +
  - o Aminoglycosides: Gram -
  - o Polymixin-B: Gram –
  - o Other: erythromycin (G+, some G -), bacitracin (G+), azithromycin (G + & -)
- Steroid
- Amniotic Membranes

#### **Amniotic Membranes**

- derived from placentas
- amniotic membrane (AM)=inner layer of the fetus membranes
- AM contains: structural proteins, specialized proteins, cytokines, growth factors
- MOA poorly understood
- faster healing, less pain, less scarring, less inflammation
- ocular history
  - o 1940 & 1992
  - $\circ$  700+ peer-reviewed publications on ocular use

# Amniotic membrane properties

- Anti-inflammatory
- Anti-fibrotic
- Anti-angiogenic
- Anti-microbial
- Promotes epithelization
- Pro-healing
- Provides matrix for cell migration/proliferation

# Case: 56 yo male Corneal Ulcer

- Treatment
  - 0.3% ciprofloxacin q30min
  - 1% cycloplegic in office
  - Prokera Slim Amniotic Membrane
  - RTC 1 day

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# Follow-up

- 1-Day: Prokera Slim 80% dissolved -replaced with new Prokera -Continue topical antibiotic q30min -RTC 1 day
- 4\_day: 2<sup>nd</sup> Prokera dissolved -resolved infiltrate -2+ SPK cornea -Taper topical antibiotic to qid -Start 1% pred acetate q2hr -copious PF ATs -RTC 2 days

#### Follow-up

- <u>6-Day</u>: -1+ SPK -D/C topical antibiotic
- -Decrease 1% pred acetate qid & increase PF ATs -RTC 3 day

• 10-day: -trace SPK -BCVA 20/25-

-IOP stable -small central epithelial scar

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#### Corneal Ulcer Clinical Pearls

- Infectious vs Non-infectious
- Be aggressive
- Don't forget about amniotic membranes



#### Case #3

- 67 year old, Caucasian male
- HPI: "can't see out of right eye", started 2 days ago
- (+) headache-right side of head
- (+) blurry vision-right eye only
- (+) fatigue, pain around back of neck X 2 wks, scalp tenderness
- (-) jaw pain/claudication

# History

• Medical history: unknown, LME 10+ yrs ago

• Medications: none

• Allergies: NKDA

• Ocular history: unremarkable LEE 2017, cataracts

· Social history: (-)EtOH, non-smoker

# **Entrance Testing**

• BCVA: HM @ 4 ft OD, 20/30 OS

• Pupils: PERRLA, (+)APD OD

· Confrontational VF: restricted OD, grossly full OS

• EOMs: Full & Smooth OU, (-)nystagmus

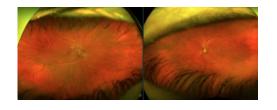
• IOP: (NCT) 10 mmHG OU

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	OD	os
E Lids & Lashes	Normal	Normal
Conjunctiv a/Sclera	Trace injection	Trace Injection
Cornea	Clear	Clear
A/C	Deep & Quiet	Deep & Quiet
Iris	Brown, WNL	Brown, WNL
Lens	2+ NS	2+ NS

# Posterior Pole Findings



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# Diagnosis

- · Differential Diagnoses:

  - o NAION, AAION, Optic Neuritis, papilledema or pseudotumor cerebri

#### What's your Diagnosis?

- Diagnosis: Arteritic ischemic optic neuropathy (AION)- Giant Cell arteritis (GCA)
- 3 Criteria for (American College of Rheumatology) Classification of GCA: Age of onest >50yrs or older

  -Age of onest >50yrs or older

  -Onset of new headache
  -Inemportal retry abnormality (tender or reduced pulsation)
  -Elevated ESR (>50mm/hr/Westergren)
  -Abnormal arretry biopsy showing necrotizing vasculitis with predominant monocular cell filtration or granulomatous inflammation

# Treatment

- ER→CBC, ESR, CRP, FBS, FTA-ABS, ANA
  - ESR >100mm/hr
  - CRP 33mg/L
  - Normal neuroimaging
     Order Temporal Artery Biopsy
- Rheumatology consult
- Vascular Surgeon → Temporal Artery Biopsy confirmed GCA
- Neuroimaging → rule out intracranial process
- Steroids  $\rightarrow$  IV 1g methylprednisolone sodium succinate X 3 days then 80mg oral prednisone

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#### 1 week follow-up

- Resolution of headaches, pain, fatigue
- No change in optic nerve edema
- Vision decreased to LP
- Rheumatology for GCA management

#### 2 week follow-up

- Resolved optic nerve edema, improved perfusion
- VA: NLP OD no improvement to-date, 20/30 OS

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#### Giant Cell Arteritis

- Most common vasculitis adults >50 years
- Incidence 18 per 100,000; Women 4X more likely
- Highest prevalence in Caucasians (Scandinavian or Northern European decent)
- Granulomatous inflammatory vasculopathy affecting medium & large sized arteries
- External carotid branches, ophthalmic, vertebral, distal subclavian & thoracic aorta
- >50 yo, females > males
- Goal: recognize & treat GCA before AION occurs

#### **Symptoms**

- Headache/scalp tenderness
- Temple artery tenderness
- Neck pain
- Weight loss
- Jaw claudication
- Weakness
- Fatigue

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- Tongue/scalp necrosis
- Unexplained fever

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# AAION (arteritic anterior ischemic optic neuropathy)

- Most common cause of severe vision loss from GCA
- Infarction of short posterior ciliary arteries that supply optic nerve
- 1 in 5 GCA patients will develop monocular vision loss related to AAION
- $\blacksquare$  1/3 patients amaurosis fugax present as sign of impending AION
- Vision loss severe & responds poorly to treatment
- If untreated, 50% lose vision in fellow eye within days to weeks of onset
- TRUE OCULAR EMERGENCY
- Acute phase  $\rightarrow$  ON appear swollen & pale, flame hemes
- Later → no edema, optic atrophy sets in

Arteritic AION	Non-arteritic AION
"older" patient population	"younger" patient population
Female > male	No relation
HA, scalp tenderness, jaw claudication	Occasional orbital pain
Better VA	Worse VA
FFA: choroidal & disc filling delay	Disc filling delay
Poor prognosis for recovery; fellow eye 95% cases	3 line VA improvement in 43% cases; fellow eye <30% cases
Urgent corticosteroid treatment	Doubtful role of corticosteroids

#### **ESR**

- Measures height of RBC's settling out of plasma per hour
- Male Norm: age/2
- Female Norm: age + 10 /2

#### GCA Ocular Manifestations

- Cranial nerve involvement (CN VI) → diplopia
- Cotton wool spots
- Central Retinal artery occlusion (CRAO)
- Visual Field defect (altitudinal, arcuate, cecocentral scotoma)
- Choroidal infarction
- Nystagmus/internuclear ophthalmoplegia
- Rare=anterior segment neovascularization/ocular ischemic syndrome

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# GCA

- Actemra (tocilizumab) = 2017 FDA expanded & approved use of subcutaneous Actemra (tocilizumab) to treat adults with GCA
  - subcutaneous
  - First FDA approved therapy specific to this type of vasculitis
- Polymyalgia Rheumatica (PMR)
  - Systemic autoimmune disease
  - Shoulder & hip girdle pain

  - 50% GCA patients also have PMR
     Controversy: GCA & PMR separate or different manifestations of same disease

# GCA Clinical Pearls

- · Thorough case history
- Prompt treatment=start tx before lab results are back
  - If aggressive steroid tx initiated within first 24hrs of onset of visual symptoms, 50% chance of vision improvement
  - Temporal biopsy should be done within 1 week of starting steroid tx
  - · Beware of normal labs
    - 15-30% patients with (+) temporal artery biopsies have normal ESR
       Biopsy temporal artery 5-9% false negative rate due to skip lesions

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# Ocular Emergency Basics

- Emergent vs Urgent
- Vision vs Life Threatening
- Acute vs Chronic
- Progressive vs Stable
- Proper Documentation

# Triaging

- Staff Responsibility
  - o Worth the training & revisit it
  - o Never offer a diagnosis or treatment plan
- Doctor Responsibility
- Document Everything!

#### Case #4

- 18 yo female athlete
- <u>HPI</u>: "pain & blurry vision in OD", hit in face with soccer ball 1 day
- (+) mild pain
- (+) photophobia
- (+) blurry vision
- (-) CT scan at ER: no orbital fractures

# History

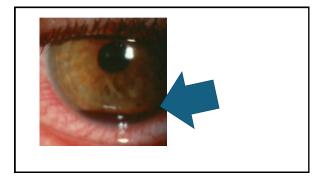
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- Medical history: seasonal allergies
- Medications: Flonase prn
- Allergies: no medications
- <u>Ocular history</u>: unremarkable LEE 1yr ago
- Social history: (-)EtOH, non-smoker

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# **Entrance Testing**

- BCVA: 20/40 OD PH 20/25; 20/20 OS
- Pupils: PERRLA, (-)APD
- Confrontational VF: FTFC OU
- •  $\underline{\text{EOMs}}$ : Full & Smooth OU, (-)restrictions, (-)nystagmus
- IOP: (iCare) 13 mmHG OD, 14 mmHG OS



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	OD	os
Lids & Lashes	Ecchymosis	Normal
Conjunctiv a/Sclera	1+ injection; temporal SCH	White & Clear
Cornea	1+ SPK; (-)edema	Clear
A/C	1+ cells 0.5mm inferior hyphema	Deep & Quiet
Iris	Hazel, (-)TIDs	Hazel, WNL
Lens	Clear	Clear

Posterior Pole Findings		
	OD	os
Vitreous	Quiet-no cells	Quiet-no cells
Optic nerve	Pink, healthy rim 0.2/0.2 C/D ratio	Pink, healthy rim 0.3/0.3 C/D ratio
Macula	Flat & clear	Flat & clear
Retina	No breaks/tears (-)commotio retinae	No breaks/tears

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# Diagnosis

- 1) Traumatic hyphema
- 2) Secondary traumatic iridocyclitis

#### Treatment

- 1% cyclopentolate TID OD
- 1% prednisolone acetate q2hr OD
- · Limit physical activity
- Sleep with head elevated
- Avoid ASA
- RTC 1 day

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# Hyphema

- Rupture of iris & ciliary body vessels
  - Direct, concussive forces cause mechanical tearing of fragile vasculature of iris or angle
  - Concussive trauma creates rapidly rising intravascular pressure resulting in
- Incidence: 17 per 100,000
- 39.2% athletic injuries, 9.9% work-related injuries
- 30% present with increase in IOP
  - Anterior Synechiae formation

  - Increased outflow resistance & fibrosis of TM
     Secondary Glaucoma=weeks to years after hyphema (20% of cases)
     Sickle trait patients have greater risk for IOP (sickled RBC not as malleable)

# Hyphema Etiology

- Blunt Trauma
- Intraocular surgery
- Iris neovascularization
- Venous occlusion
- Iris melanoma

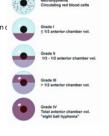
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- · Keratouveitis complication (herpes zoster)
- Blood disorder complication (leukemia, hemophilia, von Willebrand disease, ethanol/aspirin/warfarin use)

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# Hyphema Grading

- Microhyphema=blood cells suspended in a
- Grade 1=blood filling <1/3 of chamber
- Grade 2= 1/3 to 1/2 chamber
- Grade 3= >1/2 chamber
- Grade 4= chamber completely filled
- Eight-ball



# Hyphema Treatment Goal

- Decrease inflammation
- Enhance blood resorption
- Minimize complications
  - · Secondary glaucoma
  - · Corneal staining
  - Beware of rebleeding

#### Consider referral if...

- Significant corneal blood staining
- Hyphema fails to reduce to <50% of A/C volume within 8 days
- IOP greater than 60mmHG X 2 days
- 8-ball hemorrhage
- IOP elevated in patient with sickling disorder

# Other treatment options

- Limbal paracentesis & blood aspiration
- AC washout
- Oral antifibrinolytic medication
- Hospitalization if bed rest orders not followed

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# Case 4 Follow-up

- · Watched daily until hyphema resolved
- · Day 6
  - Hyphema & Uveitis resolved
  - Steroid Taper started

#### 6 weeks

- No rebound inflammation
- o gonio=no angle recession
- o BCVA 20/20
- o no lasting ocular damage to-date

# Exam Clinical Pearls: Blunt Trauma

- Pupils-PERRLA? APD? Iris sphincter or dilator muscle damage?
- EOM-Restriction?
- Anterior Chamber-Hyphema? Uveitits?
- Iris-Iridodylasis? TIDs?
- Cornea-abrasion? Laceration? Seidels?
- Lens-subluxation?
- Vitresous-hemorrhage?
- Retina-commotio retinae? Retinal break/tear/detachment?
- IOP
- Gonio-Angle Recession (perform 6 wks after initial trauma)

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# Thank you!

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